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MISR_Plot - A New Tool for the Visualization of Multispectral Multiangle Image Data

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The Multiangle Imaging SpectroRadiometer (MISR), currently orbiting the Earth aboard NASA's Terra spacecraft, collects image data with 9 multispectral cameras. One camera provides a nadir view of the Earth, while the other eight cameras are aligned 26.1, 45.6, 60.0, and 70.5 degrees fore and aft of the nadir camera. Each camera, in turn, measures radiance in 4 spectral bands (red, green, blue, and near infrared). Thus MISR produces 36 radiance measurements for every pixel in a scene. These multiangle, multispectral data allow scientists to infer the physical properties of atmospheric aerosols, clouds, and land cover from angular variations in their reflectance.

The abundance of information available for each pixel in a MISR scene presents unique challenges to an analyst, and the MISR_Plot tool was designed to address some of these challenges. MISR_Plot allows an analyst to view all of the radiance information available at a given pixel, together with a reconstruction of the illumination and viewing geometry that produced this radiance.

The radiance data are plotted as a function of viewing angle in a collection of four panels, with each panel representing a MISR spectral band. In addition to these Cartesian plots, the radiance data are also portrayed in four semi-Polar plots, with the origin of a plot representing the intersection of the 9 MISR viewing directions at the pixel in question. Using the ancillary data archived with the MISR imagery, MISR_Plot calculates and displays the solar illumination vector, vector normal to the reflecting surface, angle of incidence, angle of emergence, and phase angle on the polar plots. These plots are rendered as three-dimensional graphics that can be scaled and rotated interactively, allowing an analyst to decide upon the best visualization of the illumination and viewing geometry at a given pixel.